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PERIPHERAL CUE LEARNING SET IN RHESUS MONKEYS

Four control and nine chronic whole-body irradiated rhesus monkeys, with previous experience on standardized learning set problems and in the utilization of peripheral cues to procure food rewards, were tested on six four-trial peripheral cue learning set problems per day for 39 days. The results of the experiment were that: (1) The irradiated Ss did not differ significantly from the control Ss with respect to performance on this training. (2) There was no significant interproblem improvement in performance over the periods of testing. (3) There was statistically significant intraproblem improvement in the performance which was consistent over the periods of testing.

Murphy and Miller (2) have studied the effect of spatial contiguity of cue and reward in the object-quality learning of rhesus monkeys. Their animals completely failed to acquire the necessary discrimination in object-quality learning when the stimulus object was displaced 6 inches vertically from the site of food reward. Also, the performance of animals previously given extensive learning set training under standardized conditions decreased significantly to chance level when the spatial factor was introduced. Their animals had not had prior training on the utilization of peripheral cues to procure food rewards.

The purpose of the present study was to determine the effects of such prior training on the acquisition of peripheral cue learning sets by normal and chronic whole-body irradiated monkeys that had, also, experienced extensive learning set training under standardized conditions.

METHODS

Subjects

Four control and 9 chronic whole-body irradiated rhesus monkeys with nearly identical training histories were used as Ss in the experiment. The 9 experimental Ss had been exposed to a mixed source of gamma and neutron radiation approximately three years before the present study was initiated.

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This work was accomplished at the Radiobiological Laboratory of the University of Texas and the United States Air Force, Austin, Tex.

Five of the experimental Ss had received a total radiation dose of 154 rep and the remaining 4 experimental Ss had received a total radiation dose of 308 rep.

All of the Ss had previously experienced extensive learning set training under standardized conditions. Also, all of the Ss had been given training on the transfer of a simple learned discrimination along a peripheral cue gradient (1).

Apparatus

All testing was conducted in a modified version of the Wisconsin General Test Apparatus, the holding cage of which measured 36 x 30 x 24 inches.

A modified two-string patterned string board, as shown in figure 1, was used for the peripheral cue testing. This string board was placed directly over the stimulus tray used in standardized testing. The strings, pieces of plumber's chain, were attached in the front of the board to seated eyebolts and extended to behind a three-sided chimney in the rear center of the board. Small nails attached to the free ends of each length of plumber's chain were used to impale the food reward, a raisin, on the end of the appropriate chain. The three-sided chimney prevented the subject from responding on the basis of seeing which chain held the raisin. The cue positions for the peripheral cue learning set training were measured along the back of the board. The distance from the inner edge of each cue position to the edge of the three-sided chimney was 3.375 inches.

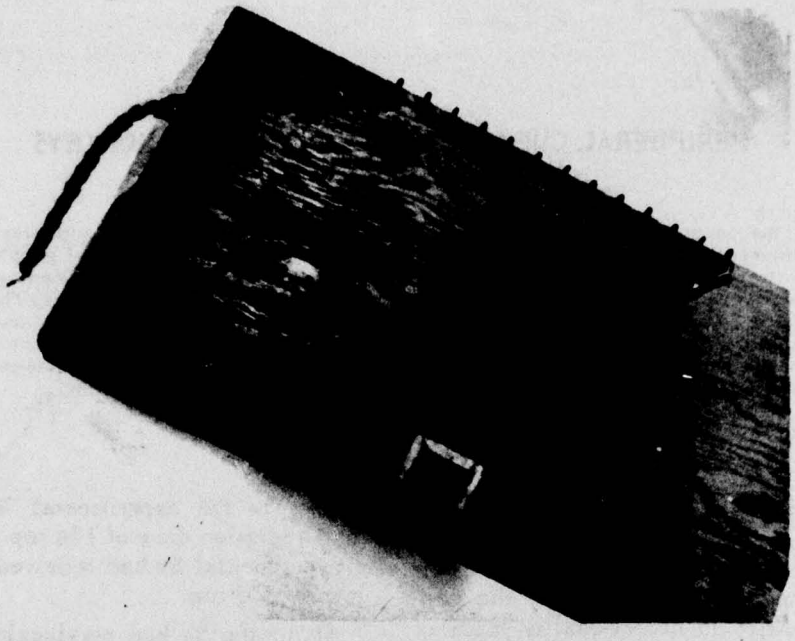

FIGURE 1

The modified two-string patterned string board used for the peripheral cue testing.

TABLE I

Analysis of variance of error scores

Source	df	Mean squares	F	P
Between subjects	12			
Groups (A)	2	43.14	.81	NS
Error	10	53.07		
Periods (B)	2	1.12	.06	NS
A x B	4	20.39	1.05	NS
Error	20	19.45		
Trials (C)	3	131.23	32.64	.001
A x C	6	4.87	1.21	NS
Error	30	4.02		
B x C	6	8.51	.80	NS
A x B x C	12	68.52	6.43	.001
Error	60	10.66		

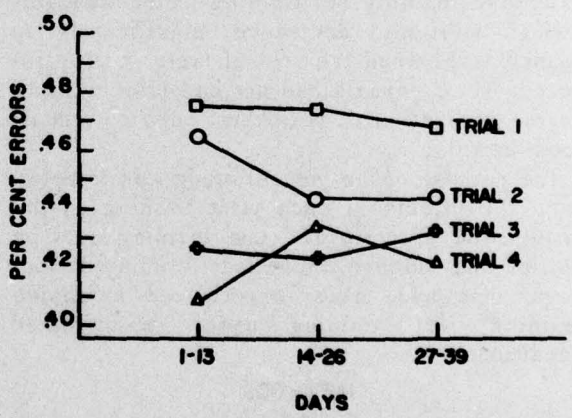

FIGURE 2

Percent errors on trials 1, 2, 3, and 4 for each of three successive 13-day training periods.

The stimulus objects consisted of 234 pairs of objects, including dime-store objects and wooden objects made at the laboratory.

Procedure

Each S was tested on six four-trial problems per day for 39 days. The Ss were tested at the same time each day for 5 consecutive days each week.

During the testing the food reward was impaled on the end of a length of plumber's chain and hidden behind the three-sided chimney in the rear center of the modified string board. Direct manual response to the length of chain on the side of the board holding the positive

object was rewarded rather than direct manual response to the object itself. The noncorrection method was used and, in consequence, each S was allowed only one choice on each trial.

RESULTS

Statistical analysis of the data, as shown in table I, yielded (a) no significant difference between groups, (b) no significant difference between periods, and (c) a difference between trials within periods which was significant beyond the 0.1 percent confidence level. Figure 2 shows the percent errors on trials 1, 2, 3, and 4 for each of three successive 13-day training periods.

DISCUSSION

In the present study, as in the work reported by Murphy and Miller (2), rhesus monkeys manifested no significant improvement in performance between periods of practice on peripheral cue learning set training. The monkeys of the present study did, however, show significant intraproblem learning. Chronic whole-body irradiated animals were not differentiated from normal animals with respect to these results.

The results are interpreted as demonstrating that both normal and chronic whole-body irradiated monkeys, with previous learning set training under standardized conditions and prior experience in the utilization of peripheral cues to procure food rewards, manifest significant intraproblem learning but fail to show interproblem learning on peripheral cue learning set problems.

SUMMARY

Four control and nine chronic whole-body irradiated rhesus monkeys, with previous experience on standardized learning set problems and in the utilization of peripheral cues to procure food rewards, were tested on six four-trial peripheral cue learning set problems per day for 39 days. The results of the experiment were that: (1) The irradiated Ss did not differ significantly from the control Ss with respect to performance on this training. (2) There was no significant interproblem improvement in performance over the periods of testing. (3) There was statistically significant intraproblem improvement in performance which was consistent over the periods of testing.

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1. McDowell, A. A. Transfer by normal and chronic whole-body irradiated monkeys of a single learned discrimination along a peripheral cue gradient. Unpublished dissertation for the Ph.D. degree, University of Texas, Austin, Tex., 1958.

2. Murphy, J. V., and R. E. Miller. The effect of spatial contiguity of cue and reward in the object-quality learning of rhesus monkeys. J. Comp. & Physiol. Psychol. 48:221-224 (1955).